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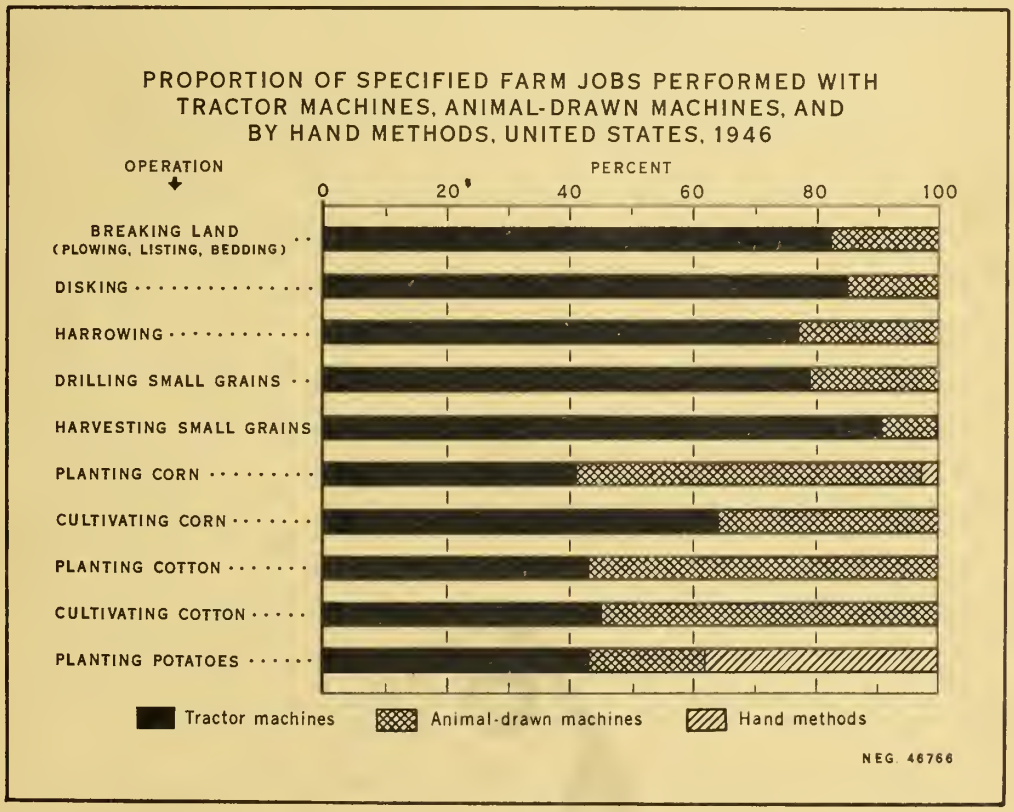
UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF AGRICULTURAL ECONOMICS

Use of TRACTOR POWER, ANIMAL POWER, AND HAND METHODS in Crop Production



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Source of Material

Basic material for this report was supplied by the voluntary crop reporters of the United States Department of Agriculture. Farmers in all parts of the country furnished estimates for their localities regarding the proportion of specified kinds of farm work performed in 1946 with tractor machines and equipment, with animal-drawn machines and equipment, and by hand methods. They made these estimates in February 1947.

The approximate number of reports received from the crop correspondents in 48 States in the February inquiry were as follows:

> For breaking land 17,800 reports; for disking 18,100 reports; for harrowing 18,000 reports; for seeding and harvesting small grains 17,000 reports; and for planting and harvesting potatoes 10,600 reports. For cultivating corn, 11,300 reports were received from 36 States; for cultivating cotton 2,700 reports from 12 States; and 12,900 reports were obtained in 35 States concerning the extent of use of manure spreaders.

For most items covered in this study, similar information had been obtained from correspondents in February 1940 covering the 1939 crop; these results were published in F.M. 18, "Hand and Machine Methods in Crop Production." In 1938 and 1943, crop correspondents furnished material on corn-harvesting methods. Results of these early studies are included in this report so that the changes in the use of power and hand methods that have since occurred can be measured.

The primary tabulation of the material concerning farm practice in 1946 was done in the State Statisticians' offices of the Bureau. The data were analyzed and prepared for tabulation in the Washington office. Caroline G. Towles, Paula Boedeker, and Alice Dickinson assisted in the tabulation and preparation of the material.

USE OF TRACTOR POWER, ANIMAL POWER AND HAND METHODS IN CROP PRODUCTION

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INTRODUCTION

Use of mechanical power for drawbar work became important in the World War I period. Then, as now, feed prices, wage rates, and farm incomes were at high levels as was domestic and foreign demand for the products of our farms.

Farm tractors (carburetor and diesel types) increased in the United States from 246,000 on January 1, 1920 to 1,545,000 January 1, 1940, and to 2,800,000 January 1, 1947. The increase in the 7 years ended with 1947 was about the same as the increase for the 20 years following 1920. In 1947, farmers bought substantially more tractors than in any other year and the increase was larger than in any previous year. Preliminary estimates for January 1, 1948 indicated there was 3,150,000 tractors on farms.

Farm motortrucks have increased at a rapid rate in recent years but there has been only a moderate increase in farm automobiles since 1940 (table 1). Naturally while carburetor and diesel tractors were increasing, horses and mules and steam tractors were declining in numbers. Total horses and mules on farms numbered 9,151,000 head on

Table 1.- Index numbers of horses and mules, tractors, ~~steam~~ automobiles, and motortrucks on farms on January 1, and related data, United States, specified years

(1935-39 average = 100) 1/

Year or period	Horses and mules, all ages	Work stock 3-years old and over	Colts under 1-year of age	Tractors (does not include steam tractors)	Automobiles	Motortrucks	Farm wage rates	Gross farm income calendar year 2/	Prices received by farmers
1910	154	131	298	---	1	0	82	71	95
1915	168	143	315	2	12	3	87	76	92
1920	163	148	216	20	55	14	205	153	196
1925	143	146	102	44	84	47	149	130	145
1930	121	126	77	74	106	92	142	109	119
1935	106	110	90	84	93	91	88	92	101
1940	92	89	101	124	106	108	107	106	93
1945	76	77	54	195	107	153	297	244	188
1946	70	72	41	208	107	159	321	278	217
1947 3/	64	66	35	225	113	178	346	332	259
1948 3/	58	61	30	---	---	---	---	---	---

1/ The 1935-39 average number of horses and mules, all ages, was 15,750,000 head; of workstock, 3 years old and over, 13,700,000 head; of colts under 1 year, 744,000 head; of farm tractors, 1,244,000; of farm automobiles, 3,896,000; of farm motortrucks, 973,000. The 1935-39 average gross farm income was 10,424 million dollars.

2/ Includes Government payments.

3/ Preliminary.

January 1, 1948, compared with the peak of 26,723,000 head in 1918. Numbers of work animals (horses and mules, 3 years old and over) on January 1, 1948 were estimated at 8,376,000, compared with the 1925 peak of 20,700,000. In 1910, when steam tractors supplied practically all the power for farm belt work there were more than 70,000 of them on farms. There are less than 10,000 now.

Conditions during the last few years have furthered the advantage of mechanical power in several ways. Prices of new tractors, of machines, and equipment, and of tractor tires, are now about one-third higher than they averaged in prewar years, and increases in prices of fuel and in other tractor costs have been substantial. Costs of use per tractor in 1947 were about 50 percent higher than the average in 1935-39. But this increase was much less than the increase in the cost per head of keeping horses and mules and in farm wage rates. Prices of feed grain in 1947 were at a record high and the cost per head of keeping horses and mules in that year was more than double the average of 1935-39.

Prices of farm products in 1947 were more than 150 percent above the prewar prices but horses and mules that year were bringing prices below the prewar average and many animals suitable for work were sold for slaughter. Heavy exports contributed to the sharp decline in horse and mule numbers in 1946 and 1947. Along with the low prices, the production of colts has declined drastically. The 1947 colt crop of 226,000 head was the smallest in more than a century. It was less than one-third of the 1934-38 average of 744,000, and in striking contrast with the 1916 record crop of 2,369,000. But the 1947 crop was enough to maintain a horse and mule population of about 4 million. As the colt crops in the next few years are expected to be small, and decidedly less than the disappearance of older animals, it seems evident that the decline in total horse and mule numbers, which began in 1918 and has been continuous since, will continue.

Tractors are effective in labor-saving, as the machines and equipment used with them are usually larger and can be operated at higher rates of travel than the animal-drawn machines. Shortage of labor and the greatly increased wage rates have sharply influenced the increase in numbers and use of tractors and tractor equipment. Farm wage rates in 1947 were at record high levels, and were about 250 percent above the prewar rates (table 1).

MECHANIZATION BY STATE GROUPS

Probably more than 60 percent of all farm work in 1948 requiring tractors or work animals will be done with tractor machines and equipment. There were 8,376,000 head of workstock on farms January 1, 1948 (table 2). Should the acreage in harvested crops in 1948 be the same as in 1947, it would require 20,080,000 work animals to provide as much animal power in relation to the harvested acreage as was used in 1920 (table 3). The number of work animals on farms January 1, 1948 was about 41 percent of the estimated required number; but, since 1920, there has been a decrease in the average number of hours worked per animal per year, so the proportion of farm work done with animal power has been even more than the decline in numbers of workstock in relation to the acreage of harvested crops.

The Southeastern, the Delta, and the Appalachian States, in 1948, have around 75 percent of the number of workstock that would be necessary to provide as much animal power in relation to cropland as was used in 1920. These Southern States use animal power much more than do other State groups. Numbers of workstock on farms January 1, 1948 in the Northeast and Lake States were about 40 percent; the Corn Belt and Mountain States, about 33 percent; and in Oklahoma-Texas, the Great Plains, and the Pacific States, 30 percent or less of the number required to provide as many work animals in relation to cropland as was the case in 1920.

In the Western States especially, a considerable number of the work animals (horses and mules 3 years old and more) in 1920 were saddle horses, pack horses and other ranch horses, many of which were not used for field work. It is believed that the percentage decline in number of animals kept for ranch work in the Western States has been less than the decline in the numbers kept for field work. So the decline on a percentage basis of animals kept for field work has probably been greater than the percentage decline in total horses and mules 3 years old and over.

In the Northeastern States, in 1947, there were more tractors in relation to the harvested acreage of crops than in any other group of States (table 2). But the tractors in these States average smaller than elsewhere and a higher percentage than in other State groups are garden and home-made tractors. Annual hours of use of tractors in the Northeast make a total that is below the average of the country, and physical conditions are less favorable for using them than in the more level areas, so the work performed per day with tractor machines, even after making allowance for size, is below the general average. It was estimated that on an average in 1947, in the Northeastern States, one tractor had displaced less than two work animals. This displacement was about half of the average for the country (table 3). In the Great

Table 2.- Number of work animals and tractors on farm, and acres in harvested crops, per work animal and per farm tractor, State groups, specified years

State group	1910	1920	1930	1940	1945	1947	1948 preliminary
			Work animals on farms, January 1 1/				
			Thousands				
Northeast		1,546	1,067	846	678	590	540
Corn Belt		4,492	3,670	2,473	2,010	1,615	1,420
Lake States		1,908	1,630	1,309	1,091	878	773
Great Plains		2,865	2,608	1,307	1,210	981	883
Appalachian		1,214	1,064	894	849	795	773
Southeast		1,993	1,692	1,561	1,475	1,399	1,353
Delta		1,263	1,242	1,110	1,054	973	920
Oklahoma-Texas		2,739	2,462	1,470	1,119	892	813
Mountain		1,446	1,308	839	784	669	633
Pacific		834	587	400	328	283	268
United States	18,010	20,300	17,330	12,209	10,598	9,075	8,376
			Tractors on farms, January 1				
			Thousands				
Northeast		18	105	166	283	327	
Corn Belt		71	256	456	667	773	
Lake States		31	133	249	386	440	
Great Plains		54	179	256	350	392	
Appalachian		4	17	27	55	68	
Southeast		10	40	53	122	150	
Delta		5	16	33	65	79	
Oklahoma-Texas		15	63	142	233	269	
Mountain		18	48	74	120	140	
Pacific		20	63	89	141	162	
United States		246	920	1,545	2,422	2,800	
			Acres of harvested crops 2/				
			Thousand acres				
Northeast		25,000	20,400	19,700	20,100	19,400	
Corn Belt		82,000	76,700	71,700	75,800	75,100	
Lake States		36,100	36,100	37,100	38,500	37,300	
Great Plains		77,100	88,100	68,600	82,100	81,900	
Appalachian		15,000	13,000	13,200	12,800	12,600	
Southeast		34,800	32,200	33,700	30,800	30,600	
Delta		16,700	18,200	18,000	15,800	16,000	
Oklahoma-Texas		40,100	47,600	42,100	40,800	43,700	
Mountain		19,900	23,300	20,800	23,100	24,700	
Pacific		13,300	13,400	14,100	15,200	15,700	
United States	325,000	360,000	369,000	339,000	355,000	357,000	

- Continued

Table 2.- Number of work animals and tractors on farm, and acres in harvested crops, per work animal and per farm tractor, State groups, specified years - Continued

State group	1910	1920	1930	1940	1945	1947	1948 preliminary
		Acres of harvested crops per work animal 3/					
Northeast		16.2	19.1	23.3	29.6	32.9	
Corn Belt		18.3	20.9	29.0	37.7	46.5	
Lake States		18.9	22.1	28.3	35.3	42.5	
Great Plains		26.9	33.8	52.5	67.9	83.5	
Appalachian		12.4	12.2	14.8	15.1	15.8	
Southeast		17.5	19.0	21.6	20.9	21.9	
Delta		13.2	14.7	16.2	15.0	16.4	
Oklahoma-Texas		14.6	19.3	28.6	36.5	49.0	
Mountain		13.8	17.8	24.8	29.5	36.9	
Pacific		15.9	22.8	35.2	46.3	55.5	
United States	18.0	17.7	21.3	27.8	33.5	39.3	
		Acres of harvested crops per farm tractor 4/					
Northeast		1,390	194	119	71	59	
Corn Belt		1,155	300	157	114	97	
Lake States		1,165	271	149	100	85	
Great Plains		1,428	492	268	235	209	
Appalachian		3,750	765	489	233	185	
Southeast		3,480	805	636	252	204	
Delta		3,340	1,137	545	243	203	
Oklahoma-Texas		2,673	756	296	175	162	
Mountain		1,106	485	281	192	176	
Pacific		665	213	158	108	97	
United States		1,463	401	219	147	128	

1/ Horses and mules, 3 years old and over.
2/ Area in 52 principal crops harvested or estimated equivalent, plus acreages in fruits, tree nuts, and farm gardens.
3/ Calculated by dividing the area in harvested crops by the January 1 number of horses and mules, 3 years old and over.
4/ Calculated by dividing the area in harvested crops by the January 1 number of tractors.

Table 3.- Reduction in numbers of work animals from 1920 to 1947 and the estimated number displaced per tractor, State groups

State group	Work animals on farms January 1, 1920 1/	Work animals needed January 1, 1947 if there were no tractors or motor vehicles 2/	Work animals on farms January 1, 1947 1/	Tractors on farms January 1, 1947	Work animals displaced per farm tractor 3/
	Thousands				
Northeast	1,546	1,200	590	327	1.9
Corn Belt	4,492	4,115	1,615	773	3.2
Lake States	1,908	1,970	878	440	2.5
Great Plains	2,865	3,045	981	392	5.3
Appalachian	1,214	1,020	795	68	3.3
Southeast	1,993	1,755	1,399	150	2.4
Delta	1,263	1,210	973	79	3.0
Oklahoma-Texas	2,739	2,985	892	269	7.8
Mountain	1,446	1,795	669	140	8.0
Pacific	834	985	283	162	4.3
United States	20,300	20,080	9,075	2,800	3.9

1/ Horses and mules, 3 years old and over.

2/ The number of work animals shown would for each State group provide as many work animals per 100 acres of harvested crops as was the case in 1920. There were 246,000 tractors on farms on January 1, 1920, but it is believed that these tractors had then effected little if any displacement of animal power, since table 2 shows that, for the country as a whole, there were slightly more work animals per 100 acres of harvested crops in 1920 than in 1910.

3/ Calculated by deducting actual numbers of workstock from number of work animals needed if there were no tractors or motor vehicles, and dividing the difference by number of tractors. Automobiles and motortrucks contributed to the displacement of work animals but apparently tractors were largely responsible for the decline in work animals.

Plains, Oklahoma-Texas, and the Mountain States where the displacement of work animals by tractors has been heaviest, the tractors are relatively large and the yearly use is above average. Physical conditions there favor their use.

TRACTORS EXTENSIVELY USED IN SEEDBED PREPARATION

The area in harvested crops of late years has exceeded 350 million acres. Probably around 300 million of these acres are broken annually; that is, plowed with moldboard or disk plows and bedded or broken with listers or middle busters before being planted. Breaking land and disking are heavy jobs. Since the introduction of tractors, a higher percentage of these jobs has been done with tractor equipment than is true of the lighter work, like cultivating and planting.

Crop correspondents report that 82 percent of the breaking of land and 85 percent of the disking, in 1946, was done with tractor equipment. Tractor use for breaking land and disking increased about 50 percent from 1939 to 1946 (table 4). In 1946, 90 percent or more of the breaking of land and disking in the Great Plains and western areas was done with tractor equipment. Use of animal-drawn equipment for breaking land continues to be prevalent in the Delta, the Appalachian, and Southeastern States where it was used for about 60 percent or more of the breaking of land in 1946. In the Southern States, the increase in use of tractor equipment for breaking land and harrowing, from 1939 to 1946, was more than 200 percent and much above the increase in other parts of the country.

Harrowing land with spiketooth and springtooth harrows is lighter work than breaking land and disking. In all areas, animal-drawn equipment was used to a greater extent for harrowing than for the heavier jobs.

MANURE SPREADERS INCREASING

Reports from crop correspondents show that about two-thirds of the manure applied to fields in this country was handled with manure spreaders. Spreaders were most prevalent in the Central Corn Belt and Lake States, where livestock numbers are large and manure production is especially important. In most Southern States only a small quantity of manure is hauled to fields as there are relatively few livestock and the animals are on pasture during much of the year. Spreaders were used for only a small percentage of the manure applied to fields in the Southern States.

Table 4.- Extent of use of tractor power for breaking land, disking and harrowing land, for all crops, and extent of use of manure spreaders, in 1939 and 1946, by States and State groups.

State and group	Percent of land breaking done with tractor machines 1/		Percent of disking done with tractor disks		Percent of harrowing done with tractor harrows		Percent of manure, straw, and compost hauled from barn lots, feed lots, etc., that was spread with manure spreaders	
	1939	1946	1939	1946	1939	1946	1939	1946
Maine	33	60	45	67	38	63	52	66
New Hampshire	47	65	55	75	46	69	59	75
Vermont	26	56	42	61	31	60	54	65
Massachusetts	51	74	60	80	48	73	59	72
Rhode Island	60	75	65	80	40	60	66	69
Connecticut	50	85	57	85	42	70	70	71
New York	52	83	65	88	56	84	46	58
New Jersey	71	91	82	93	60	85	54	73
Pennsylvania	42	78	57	85	43	77	69	79
Delaware	53	72	58	75	33	56	61	73
Maryland	38	79	56	85	32	67	65	78
Northeast	46	79	60	85	46	77	57	69
Ohio	56	87	64	90	47	83	77	89
Indiana	67	92	71	93	53	87	71	82
Illinois	79	96	79	96	60	92	71	79
Iowa	80	98	73	97	62	93	89	96
Missouri	43	75	47	77	26	62	37	52
Corn Belt	69	92	69	92	52	86	73	82
Michigan	48	89	53	90	45	86	76	91
Wisconsin	54	86	54	86	35	75	76	84
Minnesota	71	95	64	94	48	88	78	87
Lake States	62	92	59	91	44	85	77	87
North Dakota	78	98	72	98	53	93	55	56
South Dakota	80	95	75	94	64	92	72	78
Nebraska	73	94	70	93	59	89	74	80
Kansas	85	98	83	98	77	96	63	68
Great Plains	80	96	76	96	65	93	68	73

- Continued -

Table 4.- Extent of use of tractor power for breaking land, disking and harrowing land, for all crops, and extent of use of manure spreaders, in 1939 and 1946, by States and State groups - Cont'd

State and group	Percent of land breaking done with tractor machines 1/		Percent of disking done with tractor disks		Percent of harrowing done with tractor harrows		Percent of manure, straw, and compost hauled from barn lots, feed lots, etc., that was spread with manure spreaders	
	1939	1946	1939	1946	1939	1946	1939	1946
West Virginia	8	24	14	27	7	18	16	18
Kentucky	15	43	25	52	10	31	17	2/ 25
Tennessee	12	43	23	55	8	33	12	2/ 17
Appalachian	13	41	23	51	9	31	15	21
Virginia	14	40	30	58	14	37	30	2/ 35
North Carolina	14	41	28	55	9	28	7	2/ 10
South Carolina	14	42	24	56	10	30	3	2/ 5
Georgia	7	37	16	52	7	33	3	2/ 5
Florida	19	45	35	63	15	40	4	2/ 6
Alabama	11	32	22	46	8	24	4	2/ 6
Southeast	12	38	23	53	9	31	11	14
Mississippi	10	30	20	45	7	24	3	2/ 5
Louisiana	15	44	21	54	11	35	5	2/ 7
Arkansas	9	34	15	47	9	31	6	2/ 10
Delta	11	35	19	48	9	29	5	7
Oklahoma	54	81	55	83	48	79	14	2/ 20
Texas	46	83	48	87	37	79	7	2/ 10
Oklahoma-Texas	49	82	50	86	41	79	9	13
Montana	79	96	73	94	62	90	42	54
Idaho	49	84	43	79	26	63	55	71
Wyoming	65	90	54	89	37	79	41	66
Colorado	68	90	65	89	47	81	61	74
New Mexico	56	91	50	87	37	77	19	2/ 40
Arizona	84	92	82	90	64	83	24	33
Utah	49	80	39	66	28	51	52	60
Nevada	62	75	55	80	36	63	52	60
Mountain	67	91	62	88	47	80	51	65

- Continued -

Table 4.- Extent of use of tractor power for breaking land, disking and harrowing land, for all crops, and extent of use of manure spreaders, in 1939 and 1946, by States and State groups - Cont'd

State and group	Percent of land breaking done with tractor machines 1/		Percent of disking done with tractor disks		Percent of harrowing done with tractor harrows		Percent of manure, straw and compost hauled from barn lots, feed lots, etc., that was spread with manure spreaders	
	1939	1946	1939	1946	1939	1946	1939	1946
Washington	62	90	67	91	50	86	52	73
Oregon	65	92	66	91	49	87	47	67
California	88	98	90	98	76	97	42	65
Pacific	76	94	79	95	64	92	46	68
United States	55	82	57	85	43	77	~~66~~ 58	66

1/ Includes plowing with moldboard and disk plows, listing, middle busting and bedding.
2/ Crop correspondents in these States supplied no information for these items in 1947. The figures given assume a percentage increase in use of spreaders in these States about the same as the average in States supplying information concerning spreader use.

SMALL-GRAIN PRODUCTION HIGHLY MECHANIZED

Acreages of small-grain crops are highly concentrated in the Western and North Central areas where use of tractor power is dominant. Machine power is used to a greater extent for small-grain crops than for other major crops like corn, cotton, and hay.

About 90 percent of the breaking of land and disking, before small grains were seeded, in 1946, about 85 percent of all harrowing, and about 80 percent of the drilling of seed was done with tractor equipment (table 5). In the Great Plains, Oklahoma-Texas, and the Pacific Coast States, about 90 percent or more of the drilling of small grains was done with tractor equipment.

Tractor-drawn machines were used extensively for harvesting small-grains, accounting for about 90 percent of the acreage (table 6). Probably about two-thirds of the acreage was harvested with combines.

Animal-drawn machines were used for one-third or more of the acreage in the Southeast and the Appalachian States. In most Southern and Appalachian States, cradles continue to be used to a small extent in the harvest, but in all States reporting this practice a smaller percentage was cradled in 1946 than in 1939. In the Great Plains, 97 percent of the harvesting of small grain was with tractor machines. In Kansas, only 1 percent of the acreage was cut with animal-drawn machines, according to the crop correspondents' reports.

PREPARING SEEDBED, PLANTING, AND CULTIVATING CORN

For preharvest work for corn the importance of tractor power varies with the kind of work and in different parts of the country. In the Corn Belt, in the Lake States, and in the West, about 90 percent or more of the breaking and disking of land for the 1946 crop was done with tractor equipment. In the Appalachian, the Southeastern, and the Delta States, about 60 percent or more of the heavy-duty seed-beed work for the 1946 corn crop was done with animal-drawn equipment (table 7). For the crop as a whole, crop correspondents' reports indicate that 78 percent of the breaking of land, 81 percent of the disking, and 72 percent of the harrowing was done with tractor equipment. Use of such equipment for breaking and disking land that year was about 50 percent higher than in 1939. Percentage increases in use of tractor equipment from 1939 to 1946 in the South was much above the average of the country.

Of the total acreage, tractor planters were used for 13 percent of the planting in 1939 and for more than 40 percent in 1946. Animal-

Table 5.- Use of tractor power for fitting land and drilling small grains by States and State groups, 1939 and 1946

State and State group	Acreage of small grains planted for harvest in		Percent of breaking land with tractors 1/		Percent of disking with tractors		Percent of harrowing with tractors		Percent of drilling of seed with tractors	
	1939	1946	1939	1946	1939	1946	1939	1946	1939	1946
	1,000 acres	1,000 acres	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Maine	133	87	28	60	51	67	58	63	8	43
New Hampshire	14	12	47	65	55	75	46	69	20	55
Vermont	88	72	26	56	42	61	31	60	8	40
Massachusetts	14	15	51	74	60	80	48	73	24	59
Rhode Island	3	4	60	75	65	80	40	60	54	60
Connecticut	13	18	50	85	57	85	42	70	10	60
New York	1,485	1,369	54	83	66	88	57	84	8	38
New Jersey	227	245	69	90	81	92	64	85	26	74
Pennsylvania	2,139	2,045	43	78	57	85	43	75	10	45
Delaware	96	121	55	69	59	70	37	58	24	57
Maryland	531	569	36	79	55	85	33	69	6	45
Northeast	4,743	4,557	46	79	60	85	46	77	10	45
Ohio	3,296	3,364	63	87	70	90	53	83	19	64
Indiana	3,189	3,012	69	92	73	93	56	88	32	71
Illinois	5,835	5,246	80	95	79	96	60	91	36	76
Iowa	6,657	6,053	82	98	75	97	64	93	32	76
Missouri	4,544	3,513	50	75	51	77	30	62	24	55
Corn Belt	23,521	21,188	71	91	70	92	54	85	30	70
Michigan	2,437	2,734	53	90	57	90	48	86	12	63
Wisconsin	3,501	3,290	56	86	57	86	38	75	10	42
Minnesota	9,616	8,720	72	95	66	94	51	88	31	73
Lake States	15,554	14,744	65	92	63	91	48	85	23	64
North Dakota	12,921	16,404	79	98	73	98	54	93	53	92
South Dakota	8,080	9,486	80	95	75	94	64	92	61	89
Nebraska	8,008	7,769	76	94	72	93	61	89	62	87
Kansas	16,781	16,101	88	98	87	98	82	95	82	96
Great Plains	45,790	49,760	82	97	78	96	67	93	67	92

- Continued

Table 5.- Use of tractor power for fitting land and drilling small grains by States and State groups, 1939 and 1946 - Continued

State and State group	Acreage of small grains planted for harvest in		Percent of breaking land with tractors 1/		Percent of disking with tractors		Percent of harrowing with tractors		Percent of drilling of seed with tractors	
	1939	1946	1939	1946	1939	1946	1939	1946	1939	1946
	1,000 acres	1,000 acres	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
West Virginia	284	196	11	28	21	31	11	21	3	12
Kentucky	696	780	17	45	29	54	12	36	6	27
Tennessee	750	826	15	43	23	55	8	33	3	27
Appalachian	1,730	1,802	15	42	25	52	10	33	4	25
Virginia	891	845	15	40	31	58	15	37	6	23
North Carolina	953	1,072	15	47	30	59	8	32	6	33
South Carolina	831	1,004	14	43	23	58	10	30	10	49
Georgia	788	1,017	7	37	15	50	6	30	5	40
Florida	18	160	19	45	35	63	15	40	3	30
Alabama	151	320	10	34	19	49	6	27	7	24
Southeast	3,632	4,418	13	41	24	56	10	32	7	36
Mississippi	152	441	17	38	30	55	15	35	17	37
Louisiana	552	742	38	51	45	59	33	45	35	41
Arkansas	542	758	17	36	28	50	15	33	12	35
Delta	1,246	1,941	26	42	36	55	23	38	23	38
Oklahoma	7,364	8,287	70	87	70	88	64	85	70	87
Texas	6,409	9,539	72	91	73	93	65	89	73	91
Oklahoma-Texas	13,773	17,826	71	89	71	91	65	87	71	89
Montana	4,628	5,812	84	96	78	94	68	90	71	90
Idaho	1,526	1,790	51	84	45	79	28	63	27	63
Wyoming	531	639	72	90	64	89	44	79	45	83
Colorado	2,434	3,100	75	90	71	89	54	81	53	80
New Mexico	427	645	64	92	57	87	47	77	65	85
Arizona	133	233	88	92	87	91	73	84	68	89
Utah	395	511	50	80	41	66	29	51	19	48
Nevada	42	55	61	75	54	80	33	63	7	62
Mountain	10,116	12,785	74	92	68	89	55	81	56	81

- Continued

Table 5.- Use of tractor power for fitting land and drilling small grains by States and State groups, 1939 and 1946 - Continued

State and State group	Acreage of small grains planted for harvest in		Percent of breaking land with tractors 1/		Percent of disking with tractors		Percent of harrowing with tractors		Percent of drilling of seed with tractors	
	1939	1946	1939	1946	1939	1946	1936	1946	1939	1946
	1,000 acres	1,000 acres	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Washington	2,604	3,132	78	91	81	92	71	87	71	83
Oregon	1,636	1,931	68	93	70	92	53	88	47	85
California	3,164	3,567	88	98	90	98	78	97	79	96
Pacific	7,404	8,630	80	94	82	94	70	91	69	89
United States	127,509	137,651	71	90	70	91	58	85	49	79

1/ See footnote 1, table 4.

Table 6.- Acreage of small grain crops harvested with tractor machines, animal-drawn machines, and by hand methods, by States and State groups, 1939 and 1946

State and group	Acres of small grains harvested in 1939	Percent of 1939 acreage harvested with			Acres of small grains harvested in 1946	Percent of 1946 acreage harvested with		
		Tractor machines	Animal-drawn machines	Cradles		Tractor machines	Animal-drawn machines	Cradles
	1,000 acres	Percent	Percent	Percent	1,000 acres	Percent	Percent	Percent
Maine	123	27	71	2	82	64	36	—
New Hampshire	6	20	76	4	7	70	30	—
Vermont	58	20	77	3	48	45	54	1
Massachusetts	5	52	47	1	7	65	33	2
Rhode Island	1	56	34	10	1	60	40	—
Connecticut	4	27	73	—	7	70	30	—
New York	1,373	38	62	—	1,259	78	22	—
New Jersey	118	65	35	—	131	85	15	—
Pennsylvania	2,032	48	50	2	1,975	81	19	—
Delaware	82	59	41	—	97	72	28	—
Maryland	474	45	54	1	486	80	20	—
Northeast	4,276	44	55	1	4,100	79	21	—
Ohio	3,014	60	39	1	3,265	87	13	—
Indiana	2,685	66	34	—	2,855	90	10	—
Illinois	5,329	76	24	—	5,074	94	6	—
Iowa	6,190	81	19	—	5,887	97	3	—
Missouri	3,932	58	42	—	3,161	80	20	—
Corn Belt	21,150	71	29	—	20,242	91	9	—
Michigan	2,270	42	58	—	2,655	84	16	—
Wisconsin	3,291	32	67	1	3,186	76	24	—
Minnesota	9,324	67	33	—	8,508	92	8	—
Lake States	14,885	56	44	—	14,349	87	13	—
North Dakota	11,640	65	35	—	15,801	97	3	—
South Dakota	6,042	77	23	—	9,017	95	5	—
Nebraska	5,997	81	19	—	7,331	96	4	—
Kansas	11,649	90	10	—	15,026	99	1	—
Great Plains	35,328	78	22	—	47,175	97	3	—

- Continued

Table 6.- Acreage of small grain crops harvested with tractor machines, animal-drawn machines, and by hand methods, by States and State groups, 1939 and 1946 - Continued

State and group	Acres of small grains harvested in 1939	Percent of 1939 acreage harvested with			Acres of small grains harvested in 1946	Percent of 1946 acreage harvested with		
		Tractor machines	Animal-drawn machines	Cradles		Tractor machines	Animal-drawn machines	Cradles
	1,000 acres	Percent	Percent	Percent	1,000 acres	Percent	Percent	Percent
West Virginia	228	19	46	35	163	36	50	14
Kentucky	452	36	60	4	506	53	46	1
Tennessee	534	27	63	10	639	58	40	2
Appalachian	1,214	29	59	12	1,308	53	44	3
Virginia	732	35	53	12	698	64	32	4
North Carolina	735	44	36	20	816	65	32	3
South Carolina	759	31	49	20	891	69	27	4
Georgia	641	21	43	36	792	54	40	6
Florida	10	1	70	29	40	42	49	9
Alabama	117	14	60	26	240	45	51	4
Southeast	2,994	32	46	22	3,477	62	34	4
Mississippi	142	19	75	6	352	65	34	1
Louisiana	545	52	47	1	699	57	42	1
Arkansas	435	18	75	7	608	43	56	1
Delta	1,122	35	61	4	1,659	54	45	1
Oklahoma	6,290	80	19	1	7,448	90	10	—
Texas	4,837	81	18	1	8,318	90	10	—
Oklahoma-Texas	11,127	80	19	1	15,766	90	10	—
Montana	4,066	71	29	—	5,372	94	6	—
Idaho	1,345	45	55	—	1,701	79	21	—
Wyoming	374	58	42	—	567	89	11	—
Colorado	1,671	65	34	1	2,723	89	11	—
New Mexico	343	62	36	2	430	90	9	1
Arizona	75	80	18	2	138	90	10	—
Utah	357	43	57	—	468	67	33	—
Nevada	35	40	60	—	47	90	10	—
Mountain	8,266	63	36	1	11,446	89	11	—

- Continued

Table 6.- Acreage of small grain crops harvested with tractor machines, animal-drawn machines, and by hand methods, by States and State groups, 1939 and 1946 - Continued

State and group	Acres of small grains harvested in 1939	Percent of 1939 acreage harvested with			Acres of small grains harvested in 1946	Percent of 1946 acreage harvested with		
		Tractor machines	Animal-drawn machines	Cradles		Tractor machines	Animal-drawn machines	Cradles
	1,000 acres	Percent	Percent	Percent	1,000 acres	Percent	Percent	Percent
Washington	2,302	79	21	—	2,872	88	12	—
Oregon	1,256	64	36	—	1,594	90	10	—
California	2,356	89	11	--	2,707	96	4	—
Pacific	5,914	80	20	--	7,173	91	9	--
United States	106,276	69	30	1	126,695	90	10	1/

1/ Less than .5 of one percent.

Table 7.- Use of tractor power for fitting land for corn, by States and State groups, 1939 and 1946

State or group	Acreage of all corn planted		Percent of breaking land with tractors1/		Percent of disking with tractors		Percent of harrowing with tractors	
	1939	1946	1939	1946	1939	1946	1939	1946
	Thousands	Thousands	Percent	Percent	Percent	Percent	Percent	Percent
New England	202	178	41	70	51	74	39	66
New York	694	689	52	83	65	88	55	84
New Jersey	185	190	69	90	81	92	61	85
Pennsylvania	1,337	1,397	45	79	58	86	44	75
Delaware	146	145	52	74	60	76	31	59
Maryland	500	458	40	79	61	85	33	67
Northeast	3,064	3,057	47	80	61	86	45	75
Ohio	3,453	3,671	62	87	69	90	53	83
Indiana	4,098	4,600	69	92	73	92	57	88
Illinois	7,869	8,945	82	96	81	96	62	92
Iowa	9,400	11,172	82	98	75	97	64	93
Missouri	4,364	4,466	50	75	51	77	29	62
Corn Belt	29,184	32,854	73	92	72	93	56	87
Michigan	1,606	1,830	52	91	56	91	47	86
Wisconsin	2,250	2,571	56	87	57	86	36	75
Minnesota	4,493	5,514	73	95	66	94	51	88
Lake States	8,349	9,915	64	92	62	91	46	84
North Dakota	1,107	1,245	77	98	70	98	50	93
South Dakota	3,050	4,097	80	95	75	95	64	92
Nebraska	7,109	8,062	74	94	70	92	58	89
Kansas	3,316	3,154	76	97	72	96	63	92
Great Plains	14,582	16,558	76	95	72	94	60	91
West Virginia	440	306	9	23	16	25	8	17
Kentucky	2,641	2,253	14	43	25	52	10	31
Tennessee	2,714	2,207	13	42	25	54	9	32
Appalachian	5,795	4,766	13	41	24	51	9	31

- Continued

Table 7.- Use of tractor power for fitting land for corn, by States and State groups, 1939 and 1946 - Continued

State or group	Acreage of all corn planted		Percent of breaking land with tractors 1/		Percent of disking with tractors		Percent of harrowing with tractors	
	1939	1946	1939	1946	1939	1946	1939	1946
	Thousands	Thousands	Percent	Percent	Percent	Percent	Percent	Percent
Virginia	1,384	1,125	15	39	31	57	15	35
North Carolina	2,500	2,193	12	38	24	54	8	27
South Carolina	1,794	1,452	14	41	22	54	9	30
Georgia	4,480	3,313	7	37	15	51	8	33
Florida	747	703	19	33	35	49	15	31
Alabama	3,673	2,743	10	32	18	47	7	25
Southeast	14,578	11,529	11	36	21	51	9	30
Mississippi	3,254	2,417	12	27	23	42	10	19
Louisiana	1,733	1,040	16	42	20	53	10	32
Arkansas	2,350	1,509	13	33	19	45	12	30
Delta	7,337	4,966	13	32	21	45	11	25
Oklahoma	1,888	1,534	33	65	35	68	28	60
Texas	4,987	3,267	34	70	35	79	25	65
Oklahoma-Texas	6,875	4,801	34	68	35	75	26	63
Colorado	1,039	717	78	91	76	90	56	83
All other Mountain States	651	508	69	91	62	88	47	75
Mountain	1,690	1,225	74	91	71	89	53	80
Washington								
Oregon								
California								
Pacific	185	117	71	94	74	94	57	91
United States	91,639	89,788	51	78	53	81	39	72

1/ See footnote 1, table 4.

drawn planters in the latter year accounted for more than 55 percent of the corn acreage with about 3 percent of the acreage reported as hand-planted (table 8). The percentage increase in the use of tractor equipment for cultivating corn from 1939 to 1946 was greater than the increase in use of tractor equipment for seedbed preparation, but was less than the percentage increase in use of tractor planters. Almost 90 percent of the cultivating of corn in 1946 was with tractor equipment in the Great Plains States, and about 80 percent in the Corn Belt and Lake States. In the Southeast, the Delta, and the Appalachian States, animal-drawn cultivators were used for about 85 percent of the cultivating.

HARVESTING CORN FOR GRAIN

The data in tables 7 and 8 apply to the entire corn acreage, including corn for grain, silage, and all other uses. The acreage of corn for grain in most years has been around 90 percent of all corn. This means that from about 90 percent of the corn acreage, the ears are separated from the stalk by hand or by mechanical methods before the grain is fed.

Use of the mechanical field corn-picker has been increasing for years, but the rate of increase in numbers and in use has been large since 1940. Only 12 percent of the acreage of corn for grain was machine-picked from the standing stalk in 1938, compared with 27 percent in 1943 and 41 percent in 1946 (table 9). Use of mechanical field pickers was most prevalent in Iowa, Illinois, Minnesota, and the Dakotas, where more than 70 percent of the acreage of corn for grain in 1946 was harvested with them. The yield per acre in the States where pickers are used extensively is much above the average yield for the United States so a higher percentage of the total production than of the acreage has been gathered with pickers.

More than 55 percent of the acreage of corn for grain in 1946 was husked or snapped by hand from the standing stalk or shock. In the South this method usually accounted for about 95 percent or more of the acreage.

Husker shredders were used for about 3 percent of the acreage in both 1943 and in 1946. This method is most prevalent in Michigan, Wisconsin, and Ohio. No information was obtained in regard to the use of husker shredders or the extent of the use of hand methods for harvesting the 1938 crop of corn for grain.

Table 8.- Percent of corn acreage planted by specified methods and use of tractors for cultivating corn, by States and State groups, 1939 and 1946

State and group	Percent of 1939 corn acreage planted			Percent of 1946 corn acreage planted			Percent of cultivating corn with tractor cultivators	
	By hand	With tractor planters	Animal-drawn planters	By hand	With tractor planters	Animal-drawn planters	1939	1946
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
New England	20	9	71	18	35	47	13	43
New York	18	5	77	10	30	60	10	49
New Jersey	27	11	62	18	52	30	33	74
Pennsylvania	5	6	89	4	38	58	17	57
Delaware	5	6	89	2	27	71	16	46
Maryland	3	2	95	2	24	74	12	52
Northeast	10	6	84	7	34	59	15	54
Ohio	3	5	92	1	49	50	40	80
Indiana	1	9	90	—	53	47	47	84
Illinois	—	9	91	—	51	49	52	87
Iowa	—	10	90	—	42	58	58	89
Missouri	3	7	90	1	22	77	22	57
Corn Belt	1	9	90	—	44	56	47	82
Michigan	21	6	73	8	48	44	21	75
Wisconsin	11	3	86	5	21	74	18	70
Minnesota	3	7	90	1	35	64	43	85
Lake States	9	6	85	3	34	63	32	79
North Dakota	1	13	86	1	61	38	19	76
South Dakota	—	25	75	—	56	44	57	88
Nebraska	—	50	50	—	73	27	56	87
Kansas	—	45	55	—	85	15	46	89
Great Plains	—	41	59	—	70	30	51	87

- Continued

Table 8.- Percent of corn acreage planted by specified methods and use of tractors for cultivating corn, by States and State groups, 1939 and 1946 - Continued

State and group	Percent of 1939 corn acreage planted			Percent of 1946 corn acreage planted			Percent of cultivating corn with tractor cultivators	
	By hand	With tractor planters	Animal-drawn planters	By hand	With tractor planters	Animal-drawn planters	1939	1946
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
West Virginia	60	—	40	53	4	43	2	9
Kentucky	21	1	78	14	5	81	6	20
Tennessee	6	1	93	4	6	90	5	15
Appalachian	17	1	82	12	5	83	5	17
Virginia	8	2	90	5	11	84	5	10
North Carolina	5	1	94	3	11	86	2	7
South Carolina	10	1	89	7	12	81	2	10
Georgia	14	1	85	6	12	82	2	10
Florida	13	3	84	9	20	71	3	10
Alabama	15	3	82	10	15	75	4	11
Southeast	11	2	87	6	13	81	3	10
Mississippi	9	4	87	5	11	84	4	10
Louisiana	16	3	81	2	14	84	5	18
Arkansas	13	4	83	6	12	82	7	23
Delta	12	4	84	5	12	83	5	16
Oklahoma	2	15	83	—	50	50	14	55
Texas	5	26	69	3	64	33	25	70
Oklahoma-Texas	4	23	73	2	60	38	22	65
Colorado	1	53	46	1	75	24	49	80
Other Mountain States	10	31	59	7	64	29	29	69
Mountain	5	44	51	4	70	26	41	76
Washington								
Oregon								
California								
Pacific	31	21	48	13	68	19	26	75
United States	6	13	81	3	41	56	30	64

Table 9.- Corn for grain, harvest method by States and State groups, 1938, 1943, and 1946

State and group	Corn harvested for grain			Percent of acreage of corn for grain that was: Harvested with mechanical corn picker			Husked or snapped by hand from standing stalk or shock		Husked with husker shredder	
	1938	1943	1946	1938 1/	1943 2/	1946	1943 2/	1946	1943 2/	1946
	1,000 acres	1,000 acres	1,000 acres	Percent	Percent	Percent	Percent	Percent	Percent	Percent
New England	38	28	25	-	3.0	13.0	97.0	86.0	-	1.0
New York	198	131	157	1	12.6	25.0	69.6	58.0	17.8	17.0
New Jersey	144	127	125	2	12.3	20.0	86.8	79.0	.9	1.0
Pennsylvania	1,080	1,024	1,078	3	10.4	29.0	82.7	64.0	6.9	7.0
Delaware	139	130	140	3/	4.3	22.0	94.7	76.0	1.0	2.0
Maryland	463	413	416	3/	5.1	20.0	91.2	77.0	3.7	3.0
Northeast	2,062	1,853	1,941	2	9.0	25.5	84.9	68.4	6.1	6.1
Ohio	3,350	3,186	3,405	12	34.5	55.0	46.0	30.0	19.5	15.0
Indiana	4,003	4,114	4,445	22	53.8	65.0	40.3	30.0	5.9	5.0
Illinois	8,073	8,023	8,553	43	64.7	75.0	33.7	24.0	1.6	1.0
Iowa	9,844	10,127	10,600	35	62.6	76.0	36.1	23.0	1.3	1.0
Missouri	4,142	4,172	4,239	2	7.0	18.0	91.3	81.0	1.7	1.0
Corn Belt	29,412	29,622	31,242	28	51.1	64.0	44.9	32.9	4.0	3.1
Michigan	1,240	1,043	1,335	5	22.4	37.0	45.4	36.0	32.2	27.0
Wisconsin	1,164	1,302	1,247	5	20.6	37.0	37.5	28.0	41.9	35.0
Minnesota	3,360	4,102	4,323	35	65.4	76.0	28.1	18.0	6.5	6.0
Lake States	5,764	6,447	6,905	22	49.3	61.4	32.9	23.3	17.8	15.3
North Dakota	307	419	437	5	60.8	72.0	36.8	25.0	2.4	3.0
South Dakota	2,231	2,799	3,529	18	43.6	72.0	55.8	27.5	.6	.5
Nebraska	6,613	7,499	7,579	4	21.3	45.0	78.6	54.5	.1	.5
Kansas	1,944	2,987	2,469	1	11.8	24.0	87.7	75.7	.5	.3
Great Plains	11,095	13,704	14,014	6	24.7	49.0	74.9	50.5	.4	.5
West Virginia	412	347	293	3/	.4	2.0	98.3	96.0	1.3	2.0
Kentucky	2,484	2,457	2,201	2	1.5	8.0	94.3	88.5	4.2	3.5
Tennessee	2,628	2,508	2,125	-	1.0	3.0	97.8	96.0	1.2	1.0
Appalachian	5,524	5,312	4,619	1	1.2	5.3	96.2	92.4	2.6	2.3

- Continued

Table 9.- Corn for grain, harvest method by States and State groups, 1938, 1943, and 1946 - Continued

State and group	Corn harvested for grain			Percent of acreage of corn for grain that was: Harvested with mechanical corn picker			Husked or snapped by hand from standing stalk or shock		Husked with husker shredder	
	1938	1943	1946	1938 1/	1943 2/	1946	1943 2/	1946	1943 2/	1946
	1,000 acres	1,000 acres	1,000 acres	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Virginia	1,287	1,225	1,066	3/	1.0	10.0	95.3	87.0	3.7	3.0
North Carolina	2,388	2,252	2,106	3/	.6	4.0	96.8	94.0	2.6	2.0
South Carolina	1,818	1,553	1,415	3/	.1	2.0	99.9	98.0	—	—
Georgia	4,504	3,511	3,064	3/	.1	1.0	99.9	99.0	—	—
Florida	694	595	560	—	—	2.0	100.0	98.0	—	—
Alabama	3,564	3,128	2,640	—	.1	1.0	99.9	99.0	—	—
Southeast	14,255	12,264	10,851	—	.3	2.6	98.9	96.7	.8	.7
Mississippi	3,162	2,626	2,173	3/	.1	1.0	99.9	99.0	—	--
Louisiana	1,673	1,242	975	3/	.1	1.0	99.9	99.0	—	--
Arkansas	2,228	1,670	1,435	—	.3	1.0	99.7	99.0	—	—
Delta	7,063	5,538	4,583	—	.2	1.0	99.8	99.0	—	—
Oklahoma	1,652	1,573	1,427	—	2.7	6.0	97.2	94.0	.1	—
Texas	4,725	4,572	3,158	—	.7	6.0	99.3	94.0	—	—
Oklahoma-Texas	6,377	6,145	4,585	—	1.3	6.0	98.7	94.0	—	—
Colorado	777	676	444	4.0	11.9	28.0	87.4	71.0	.7	1.0
Other Mountain States	367	275	204	.5	6.7	12.0	93.3	87.0	—	1.0
Pacific	92	70	51	—	12.7	30.0	87.3	70.0	—	—
United States	82,788	81,906	79,439	12.0	27.1	41.1	69.6	55.9	3.3	3.0

1/ From data published in the July 1939 Labor Release.
2/ For more detailed information concerning corn harvest methods, see B.A.E. Report F.M. 49 "Harvesting the Corn Crop," U.S. Department of Agriculture. (Processed.)
3/ Less than one-half of 1 percent.

PREPARING SEEDBED, PLANTING, AND CULTIVATING COTTON

Use of tractor equipment for breaking land and for harrowing before cotton is planted, about doubled from 1939 to 1946 (table 10). Even so, the use of tractor equipment was substantially less for cotton than for small grains and corn. The cotton areas of California, Arizona, New Mexico, Texas, and Oklahoma are relatively highly mechanized, and in these States more than 80 percent of the breaking of land and usually more than 75 percent of the harrowing was with tractor equipment.

Animal-drawn equipment was used for most of the work of seedbed preparation in the Southeast States and in all mid-Southern States, except Missouri. Tractor planters and tractor cultivators were little used in the Southeast and the Middle-Southern States, in 1939. Although the percentage increase in tractor-drawn planter and cultivating equipment from 1939 to 1946 was very substantial, animal-drawn planters and cultivators still accounted for a large percentage of the 1946 acreage.

In Oklahoma, Texas, and the West, about 70 percent or more of the planting and cultivating of cotton in 1946 was with tractor equipment, and in Missouri tractor cultivators were used for more than half of the cultivating of the crop.

HARVESTING COTTON

Methods of harvesting cotton include hand-picking, snapping and stripping by hand, stripping with machine strippers, and picking with the mechanical cotton picker. Picking by hand, the long-established method, accounted for about 82 percent of the 1945 crop and about 84 percent of the 1946 crop. More than 99 percent of the cotton in the Southeast States was picked by hand as was more than 86 percent of the crop in the Middle-Southern States and in the West.

Snapping and stripping by hand has been done to some extent for more than a quarter of a century. Almost half of both the 1945 and 1946 crops in Oklahoma-Texas were so harvested (table 11). Harvesting by hand-stripping or snapping in the West and in the Middle-Southern States accounted for around 10 percent of the crop.

Machine strippers and the mechanical cotton pickers have been in the development stage for two decades or more, but only 1 percent of the 1945 crop and an even smaller part of the 1946 crop was machine-harvested. In Oklahoma-Texas about 2 percent of the cotton crop was machine harvested, practically all with the stripper. In the Middle-South and in the West most of the cotton harvested by machine methods was gathered with mechanical cotton pickers.

Table 10.- Use of tractor power for preparing seedbed, planting and cultivating cotton, State groups, 1939 and 1946

State and State group	Area in cotton July 1		Percentage of - Land breaking done with tractors		Percentage of - Harrowing done with tractors		Percentage of - Planting done with tractors		Percentage of - Cultivating done with tractors	
	1939	1946	1939	1946	1939	1946	1939	1946	1939	1946
	1,000 acres	1,000 acres	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Virginia	33	20	1/ 17	58	1/ 12	49	1/ 2	23	1/ 3	14
North Carolina	754	576	14	47	9	33	1	13	1	8
South Carolina	1,248	963	14	42	9	31	1	12	1	10
Georgia	1,989	1,217	7	36	8	30	1	12	1	10
Florida	74	20	1/ 7	25	1/ 8	23	1/ 1	12	1/ 1	6
Alabama	2,100	1,545	10	33	7	25	3	15	5	14
Southeast	6,198	4,341	10	38	8	29	2	13	2	11
Mississippi	2,662	2,349	16	35	13	32	6	16	7	16
Louisiana	1,154	833	15	46	11	39	3	18	4	21
Arkansas	2,187	1,729	14	42	13	38	3	15	6	14
Tennessee	733	625	16	44	14	34	1	8	6	16
Missouri	380	318	24	76	20	61	4	30	13	55
Mid-South	7,116	5,854	16	42	13	37	4	16	6	18
Oklahoma	1,855	1,074	44	81	38	78	28	69	25	73
Texas	8,874	6,283	49	85	40	82	45	80	43	83
Oklahoma-Texas	10,729	7,357	48	84	40	81	42	78	40	82
New Mexico	96	120	49	86	34	70	39	70	41	80
Arizona	189	145	89	94	77	88	65	80	76	85
California	334	359	85	97	71	95	71	85	73	90
Mountain and Pacific	619	624	81	94	67	89	64	81	69	87
Total or average	2/ 24,662	18,176	30	60	25	54	21	43	21	45

1/ No reports received from crop correspondents. Estimates based largely on reports from adjacent or nearby States.
2/ The above 16 States had more than 99.9 percent of the U. S. cotton acreage in 1939 and in 1946.

Table 11.- Proportion of cotton harvested by specified methods, by regions, 1945 and 1946 crops 1/

State group	1945 crop			1946 crop		
	Hand picked	Hand snapped	Machine harvested 2/	Hand picked	Hand snapped	Machine harvested 2/
	Percent	Percent	Percent	Percent	Percent	Percent
Southeast	99.3	0.7	3/	99.4	0.6	3/
Middle-South	4/86.5	12.8	0.7	90.9	9.1	3/
Oklahoma-Texas	50.0	47.5	2.5	49.3	48.7	2.0
Mountain and Pacific	88.0	11.9	0.1	87.6	11.9	0.5
Total or average	82.0	17.0	1.0	83.9	15.7	0.4

1/ Adapted from table 17 in "Charges for Ginning Cotton," Production and Marketing Administration, U. S. Department of Agriculture, September 1947. (Processed.)

2/ Includes machine-picking and machine-stripping.

3/ Less than 0.05 percent.

4/ Includes the Delta States (Mississippi, Louisiana, and Arkansas), and Tennessee and Missouri.

PLANTING AND HARVESTING POTATOES

Reports from crop correspondents show that 62 percent of the 1946 acreage was machine-planted and 54 percent was harvested with elevator-type diggers (table 12). Machine methods are in extensive use in all parts of the country where the bulk of the potato acreage is for commercial purposes. In these areas many farmers grow an acreage that is large enough to make the planting and harvesting by machines an advantage.

Hand methods generally prevail in the South and in some Corn Belt and Northeast States where the potato crop is used largely in the area where grown.

About 48 percent of the acreage in 1939 was planted by hand and only 38 percent in 1946. There was a marked increase in use of tractor planters, and a sharp decline in the use of animal-drawn planters. Of the total acreage about 14 percent was planted with tractor planters in 1939 and about 43 percent in 1946. In the South the use of elevator-type diggers accounted for a considerably smaller percentage of the acreage than did machine planters. In most other groups of States the percentage of the acreage that was dug with elevator-type diggers was only slightly smaller than the acreage that was machine planted. About 46 percent of the total acreage in 1946 was harvested with plows, listers, middle busters, plow-type diggers, and hand tools. Planting by hand and harvesting with these implements and tools is the common practice on the great bulk of farms. It is believed that most farmers who raise 5 acres or less of potatoes, plant the crop by hand, and use equipment other than elevator-type diggers for harvesting. In 1944 about 97 percent of the 2,065,000 farmers who harvested potatoes had less than 5 acres of potatoes per farm, and 91 percent had less than two acres, according to the United States Census.

Although only 3 percent of the farms reporting potatoes in 1944 had more than 5 acres of potatoes per farm, these farms had about 60 percent of the potato acreage in that year.

Table 12.- Extent of using tractor power, animal power, and hand methods for planting and harvesting potatoes, State groups, 1939 and 1946 - Continued

State and group	Acres planted		Percent of acreage in 1939 planted			Percent of acreage in 1946 planted			Percent of 1946 acreage harvested with	
	1939	1946	With tractor-drawn planters	With animal-drawn planters	By hand	With tractor-drawn planters	With animal-drawn planters	By hand	Elevator type diggers	All other methods
	1,000 acres	1,000 acres	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
West Virginia	32	27	1	10	89	4	6	90	5	95
Kentucky	44	37	1/ 1	1/ 9	1/ 90	1	10	89	10	90
Tennessee	43	37				1	12	87	5	95
Appalachian	119	101				2	10	88	7	93
Virginia	76	69	2	54	44	4	53	43	20	80
North Carolina	82	83				12	13	75	15	85
South Carolina	24	24				4	18	78	10	90
Georgia	23	23				4	10	86	2	98
Florida	31.2	40.8				54	6	40	20	80
Alabama	48	46				31	9	60	20	80
Southeast	284.2	285.8				16	23	61	16	84
Mississippi	22	27				1	13	86	1	99
Louisiana	40	42				6	14	80	2	98
Arkansas	40	37				1	6	93	1	99
Delta	102	106				3	11	86	1	99
Oklahoma	29	21				5	10	85	2	98
Texas	46	54				20	10	70	2	98
Oklahoma-Texas	75	75				16	10	74	2	98
Montana	17	18	7	35	58	30	20	50	50	50
Idaho	133	184	14	75	11	63	32	5	94	6
Wyoming	17	13.3	39	47	14	66	20	14	75	25
Colorado	85	91	38	53	9	81	11	8	86	14
New Mexico	3	4				20	55	25	60	40
Arizona	1.5	6.9				70	10	20	75	25
Utah	13.3	18.6	3	68	29	14	59	27	55	45
Nevada	2.2	3.2	1/ 10	1/ 50	1/ 40	35	40	25	75	25
Mountain	272	339				63	27	10	86	14

- Continued

Table 12.- Extent of using tractor power, animal power, and hand methods for planting and harvesting potatoes, State groups, 1939 and 1946

State and group	Acres planted		Percent of acreage in 1939 planted			Percent of acreage in 1946 planted			Percent of 1946 acreage harvested with	
	1939	1946	With tractor-drawn planters	With animal-drawn planters	By hand	With tractor-drawn planters	With animal-drawn planters	By hand	Elevator type diggers	All other methods
	1,000 acres	1,000 acres	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Maine	154	219	16	72	12	67	23	10	95	5
New Hampshire	7.1	6.1	6	38	56	40	12	48	51	49
Vermont	12.7	8.7	5	21	74	10	20	70	31	69
Massachusetts	15.9	21.2	19	19	62	30	10	60	45	55
Rhode Island	4.3	8.1	1/ 43	1/ 27	1/ 30	60	15	25	70	30
Connecticut	15.2	18.3	1/ 20	1/ 35	1/ 45	40	25	35	60	40
New York	199	176	20	38	42	51	16	33	69	31
New Jersey	53	68	36	46	18	72	20	8	78	22
Pennsylvania	167	132	11	49	40	40	20	40	50	50
Delaware	4	3.4	1	30	69	13	20	67	11	89
Maryland	21	17	3	39	58	15	30	55	10	90
Northeast	653.2	677.8	1/ 17	1/ 49	1/ 34	54	20	26	71	29
Ohio	100	55	1/ 5	1/ 43	1/ 52	26	27	47	35	65
Indiana	48	29	5	23	72	25	10	65	25	75
Illinois	37	18	1	1/ 14	1/ 85	8	6	86	5	95
Iowa	56	24	2	1/ 13	1/ 85	6	8	86	12	88
Missouri	41	26	1	21	78	4	11	85	10	90
Corn Belt	282	152	1/ 3	1/ 27	1/ 70	17	15	68	22	78
Michigan	228	153	5	28	67	33	17	50	45	55
Wisconsin	182	115	2	36	62	17	25	58	44	56
Minnesota	235	156	13	47	40	33	27	40	60	40
Lake States	645	424	7	37	56	29	23	48	50	50
North Dakota	149	154	35	48	17	73	12	15	70	30
South Dakota	30	29	1/ 10	1/ 40	1/ 50	27	22	51	35	65
Nebraska	90	68	51	25	24	68	10	22	75	25
Kansas	28	17	10	21	69	30	10	60	30	70
Great Plains	297	268	1/ 35	1/ 38	1/ 27	64	12	24	65	35

- Continued

Table 12.- Extent of using tractor power, animal power, and hand methods for planting and harvesting potatoes, State groups, 1939 and 1946 - Continued

State and group	Acres planted		Percent of acreage in 1939 planted			Percent of acreage in 1946 planted			Percent of 1946 acreage harvested with	
	1939	1946	With tractor-drawn planters	With animal-drawn planters	By hand	With tractor-drawn planters	With animal-drawn planters	By hand	Elevator type diggers	All other methods
	1,000 acres	1,000 acres	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent
Washington	37	44	12	53	35	62	17	21	74	26
Oregon	33	53	1/ 21	1/ 44	1/ 35	82	6	12	81	19
California	68	119	1/ 70	1/ 20	1/ 10	93	2	5	95	5
Pacific	138	216	1/ 43	1/ 34	1/ 23	84	6	10	87	13
United States	2867.4	2644.6	2/ 14	2/ 38	2/ 48	43	19	38	54	46

1/ Revised figures as originally published in table 7, F. M. 18, "Machine and Hand Methods in Crop Production." U. S. Dept. of Agr. (Processed).

2/ Estimated average of all 48 States. In developing this average it was estimated that in the 13 States not covered by the 1939 survey 80 percent of the 1939 acreage was planted by hand, 4 percent with tractor planters, and 16 percent with horse-drawn planters.

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